The Contribution of Visual Imagery to Verbal Thought. A Comparative Study of Seeing and Blind Subjects

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some of the gentlemen drifted away absolutely from the subject discussed in Dr. Pogue's paper.

Dr. Pogue (closing): A discussion running so far adrift would not be permitted in some scientific meetings; it was almost a clinic. When you speak of environment, you must remember that the child is born into a family, is born in the same environment of the other children in that family. There is no different condition surrounding this particular one. In regard to Dr. Grinker saying that abortion may be one of the causes I do not know. If you think of the great mass of women I feel there are few trying abortion. It was recently brought up that professional bridge players are not bearing children. They are. Toxic drugs, of course, will produce toxemia just the same as alcohol, but I have touched my point in my paper.

THE CONTRIBUTION OF VISUAL IMAGERY TO VERBAL THOUGHT. A COMPARATIVE STUDY OF SEEING AND BLIND SUBJECTS.

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The problems presented by atypical individuals, be they insane, feeble-minded, retarded, criminalistic, blind, or deaf, when viewed from a psychological standpoint fall into three distinct groups—the diagnostic, the therapeutic and the research.

The psychologist has at hand a more or less vast collection of data concerning mental processes and conditions, which goes far toward making possible an understanding of an unusual mental type. These data are exact methods of applying them to individual cases, make it possible for the psychologist to render service in the clinical examination and subsequent explanation of atypical cases.

The psychologist is also equipped, as a result of the studies in genetic psychology and in the psychology of education with much information which guides him in discovering the best methods, be they educational or re-educational, of handling individual cases in order to overcome or to alleviate existing abnormal conditions.

These are the immediately practical, socially important problems. The third class of problems is no less practical ultimately. It is possible through a systematic study of the data collected in the examination of atypical individuals to contribute definite information to the science of psychology, information which will in time make the diagnostic and therapeutic work much more positively useful than it is today. Experimental psychology is at the present time still in its youth, still in the period of rapid growth, the formative period, and the study of atypical individuals should in the next few years make important contributions toward its development.

Two years ago I presented before this organization one of the standardized diagnostic methods, last year I attempted to demonstrate the practical usefulness to the community of the application of such methods, for this meeting I have chosen one of the more technical research problems.

Given a complex situation to study it is always necessary to reduce it as far as possible to its elements. This is difficult to do, and still more difficult is it to isolate an element for study after it has been discovered. There are two ways of proceeding from this point, isolating the element as completely as possible for study or substituting a complex situation like the first but minus the element in question. The difference in the two situations can then be attributed to the element in question plus the results of its interaction on the situation in toto and on its parts.

Considering a mental experience of any given individual such a complex situation, the task of the psychologist is to analyze it into its simplest processes and discover the contribution of each to the extremely complex whole. The greatest difficulties encountered in the course of such an analysis arise from the complexity of even the most simple mental experience and the consequent difficulty while studying one aspect of excluding the modifying influences of others.

In atypical individuals the various mental processes are not so evenly balanced as in normal persons; it frequently happens with the former that certain aspects of the mental life stand out very prominently while other aspects are nearly submerged or entirely lost. With the insane for instance, some one emotional attitude may remain fixed for months or even years; it is apparently immune to all environmental influences and an unexampled opportunity is offered for its minute analysis. Among the feeble-minded we meet individuals whose development has stopped short of all the higher imaginal and rational processes and of all the altruistic emotions, and we have before us the phenomenon of the human mind deprived of those characteristics which have soestablish in their loins will bring forth the quality and kind of their mental condition at the time the seed was established, we would have a different state of affairs. It is necessary for the doctors to teach the boys of this country, this world, the importance of genuine fatherhood and not throw the responsibility on the mothers as they have been doing. In one family, where the record was kept, we have seven different characteristics brought out and the different characteristics that are found in these children conform exactly to the record that was kept—the mental condition of the father—the mother knowing nothing whatever about it.

I have a case right here in the city of Chicago in which a father has three very bright children. He got into a mental condition all upset and nervous through drink and other things and had two or three big doses of morphin; in fact, he was almost insane. His wife tried to keep him from going away one night and that night a child was conceived; that child is now an insane child, feeble-minded, unable to take care of itself. Now, the paper in the main was excellent, but the defects come, 99 cases in 100, through the germs that are established in the father's loins and I hold to that from the records I have in my possession.

Dr. S. A. Koppnagle: I have listened with very much interest to this gentleman and I will give the gentleman my telephone and he can call up my wife and she will tell him exactly the same thing as I am telling you now. When I graduated from college and one of the teachers made similar remarks, I said to myself, if I ever get married I shall experiment in this upon my own family. The teacher told me that if I would do some crooked work my child would be crooked; if I drank, my child would be a drunkard, etc. Well, I began to do some crooked work; of course, work that would not hurt anyone. I began to drink exactly at the time when the doctor here stated; it is the most dangerous for the offspring. Well, to make my story short, every one of my children are as honest as I am, if I am honest. They are all very honest, very sincere, studious, intelligent, graduates all of high schools and universities, but these things have not had any effect upon them whatever. If anything has any effect upon mental deficiency it is the environment.

Dr. Julius Grinker. I think Miss Pogue's paper a very excellent one. She has brought out some very fine points. No doubt the paper is a classic, and though we cannot agree with everything she said, yet I am sure the medical men and women here will agree with her in the essentials. Nutritional changes, I believe, are about the only thing that we can today get hold of, because the subject itself is shrouded in obscurity. It is more so than insanity itself. It appears that feeble-mindedness has its roots way back in our ancestors and is hastened by the immediate parentage, particularly by the nutritional changes going on in the mother and perhaps the chemical changes brought about in the father's make-up during conception. As to alcoholism and anything tending to produce intoxication, I think there is no doubt that it serves as a factor, because we see daily epileptics and feeble-minded the offspring of alcoholism. But if the statement that the mental frame of mind immediately preceding the birth of a child has any effect, virtue or vice, I think that is phrenology. It is pure hearsay. At this time many women attempt abortion before the child is born; in other words, they use methods of preventing conception that are in the nature of poisons. They are taking poisons when they discover they have first conceived. I have myself come across several instances in which I am certain that the feeble-mindedness of the child was due to abortion medicine taken by the mother. But the great cause must be sought much further back, not perhaps in the immediate ancestry, but perhaps further back, and so we are again where we started. Feeble-mindedness is one of the greatest problems and it is only when the race will have established rules the same as we have in mating cattle; if we could just simply mate a true race with another true race, then only may we hope to produce normal offspring. But as matters stand today I believe that the problem cannot at all be solved and we still must do that which we can, viz., improve the nutrition of the father and mother and the infant in its early days.

Dr. Meyer Solomon: The paper of Dr. Pogue is, I think, admirable. It is extremely sane and she takes the subject up in a way which should meet with the approval of all people who consider the subject of the feeble-minded from a scientific and broad standpoint. The statements we have been hearing here this afternoon about the effect of the thoughts that an individual may have upon the offspring or statements which we have been hearing in regard to the history for thousands of years, remind me of theosophy, astrology and all those things which depend upon certain ideas which individuals have conceived and which they are fixed upon as a religion and which they stick to in spite of anything which may be said to the contrary. There has not been one iota of fact produced to show that thoughts of individuals before conception or any other time have any influence upon the offspring, except this, that certain trends which an individual may have, dependent upon the constitution and germ cells, may be transmitted to the offspring. If all the thoughts which we have or any of the special tendencies which we develop were transmitted to the offspring I fear that intsead of being way up in the scale of development in evolution as we are now, we would be once more down to the stage of the ameba. If all evil at the time of conception were transmitted to the offspring, we would have an awful world. The law of nature has so arranged things that thoughts or even characteristics are not transmitted to the offspring. That is one of the fundamental things in biology about which there ought not to be any discussion at all, and we regret exceedingly that cialized and civilized mankind. With the blind and the deaf the situation is still a different one. These persons are deprived of one of the avenues through which our perceptions of things are built up, they are each deprived of one of the chief classes of the elements of thought. The congenitally blind can never think of space, of form, of color as we do, for the elements of such thinking are absent. The congenitally deaf can never think of words as we do, and as thought is predominately verbal it follows that they cannot *think* as we do.

It may seem strange to state that possibly the most fruitful method of studying the contribution of vision to the thought processes will prove to be through a study of the thought processes of the blind and that possibly the most fruitful method of studying the contribution of audition to the thought processes will prove to be through a study of the thought processes of the deaf, but to me it seems most probable. Given otherwise normal individuals, we have in the blind and the deaf mentalities just like our own minus one important activity; the difference between the mentality of these individuals and our own then must be that one activity plus its interrelations with the other mental activities.

That there is a difference in the resulting mentality which cannot be overcome by intensive and specialized educational training is evident without scientific research to those who come constantly in contact with the blind and the deaf. On first visiting schools for these classes I was impressed by such statements from the superintendents as the following: "O I know the deaf so well, I know just what to expect from them. The deaf are a peculiar people, and one must know them in order to learn how to handle them," and "That is just what I should expect from a blind man, the blind are not just like seeing people you know; you learn to know them after living with them a while."

With this rather long preface I am going to present for your consideration a little study of the contribution of visual imagery to verbal thought, made by a comparative study of blind and normal persons. It is assumed first of all that much of our thought, if not all, is carried on by means of memory images of various modalities, that most of our consciousness apart from its sensory elements is made up of memory images, the result of some past sensory experience. We all speak of seeing with our mind's eye; we are then, in more technical language, experiencing visual images. We also hear with our mind's ear, smell with our mind's nose, taste with our mind's tongue, and feel with our mind's fingers, though these figures of speech are not so generally employed. In these several instances we are experiencing auditory, olfactory, gustatory and tactual memory images.

A very large part of our thinking is carried on by means of words, by means of internal language as it is called, or more technically endophasia. Now our analyses of these word images show them to be made up of visual images, or memories of the appearance of words and letters, of auditory images, or memories of the sounds of words and letters, and of motor images or memories of the speaking or writing of words and letters. There is present besides a consciousness of the meaning of the word which seems to belong inseparably to the complex of verbal images which constitute the word experience.

Those of you who are conversant with the recent controversy on the psychology of the higher thought processes and of imageless thought, may of course, disagree with the last concept and perhaps with those that precede it, and those of you who have been following the thought of the behaviorists may think the whole discussion wide of the mark. Whatever future research may discover, the analysis above outlined is still widely accepted and the belief in the existence of imageless thought does not necessarily exclude the recognition of mental imagery also.

Most of our data concerning mental imagery depend in the last instance upon introspection, they are gathered by the introspective method; certain tasks are given to a number of persons who are afterward asked for an account of what and how they thought and felt during the experience. The ability to give such an account with any sort of accuracy or adequacy presupposes much practice and also a psychological view point. One who has not the practice overlooks much of the experience and one who has not the psychological viewpoint does not know how to describe what he does observe. When it is possible to check up introspections with quantitative results or to dispense entirely with introspection and depend absolutely on quantitative results we feel that we have secured a more reliable method.

In February, 1912, Miss Mabel Ruth Fernald, of the Chicago Normal School, published a monograph on the "Diagnosis of Mental Imagery." This study is a very interesting piece of work and reports the results of many kinds of tests made on a group of trained subjects. Introspections were obtained in all cases and the attempt was also made to determine whether any of the tests used had a purely objective value, that is, whether their quantitative results apart from introspections could be depended on to indicate what kinds of imagery the subject had employed. Miss Fernald found no test which she considered of value as a purely objective test but several quantitative results of which might be used in conjunction with introspection. Among the latter were two tests which seemed to be more adequately performed by persons who were ready visualizers. In the first test the subject was required to spell quite difficult words backward. The difficulty and unusualness of the task prevents an automatic reply and the mental processes used in its solution become apparent to the trained subject, and sometimes also to the experimenter. The second was a similar test: in it the words were spelled backward by the experimenter and the subject was required to name them. Comparison of Miss Fernald's quantitative results, that is, the errors made and time taken, with the subject's introspections, indicate that the subjects who were the best visualizers stood the best tests, although the results were not conclusive enough to indicate that the successful performance of the test necessitates clear visualization.

It occurred to me that we might get some additional evidence concerning the objective value of these tests in determining the use of visual imagery in a given subject, by testing them out on subjects who had no visual imagery, subjects who had been blind since infancy. A comparison of the quantitative results obtained from a group of such blind persons, with the quantitative results obtained from a group of seeing persons, would undoubtedly reveal whether the absence of visual imagery is a severe handicap in the performance of the test.

The blind subjects were six high school pupils of the Illinois School for the Blind at Jacksonville, the seeing subjects six normal adults all of them in the early twenties; four are teachers of children and two are stenographers. All of these subjects were entirely unpracticed as subjects in any sort of mental testing, and all had sufficient education to rule out the ability to spell as a factor in the results. I later used the tests with five additional blind students, this time with the special aim of observing method and studying quality of errors.

The results briefly are as follows. The first test calls for the spelling of 22 words backward, the time for spelling each word, and the number of errors made were recorded. I then computed for each individual and each group, the average time, the average number of errors per word, and a general efficiency index. The efficiency index was secured as follows: 100 was arbitrarily assumed as a maximal accuracy grading per word, from this was deducted the average error per word and into the accuracy index thus secured was taken the average time, the result expressing the general efficiency. The formula is $E = \frac{A}{S}$, E, standing for efficiency, A for accuracy and S for speed.

The results for the seeing group are, average number of errors per word, 0.76, average time per word, 22.63 seconds, and efficiency index, 4.39. The results for the blind group are, average number of errors per word, 1.11, average time per word 25.91 seconds, and efficiency index 3.82. This is a difference in error of 0.35, in time of 3.28 seconds, and in efficiency of 0.57 in favor of the seeing subjects. The difference is not so great in any instance as that between the average of the least successful of the seeing group and the average for the seeing group—(0.83 difference in error, 15.17 seconds difference in time, 1.80 difference in efficiency), and not so great even as the differences between the averages for this same seeing subject and the averages for the blind group—(0.48 difference in error, 11.89 seconds difference in time and 1.053 difference in efficiency), *these differences being in favor of the blind.*

The second test calls for recognition by the subject of 22 moderately difficult words spelled backward by the experimenter. The speed and accuracy are both indicated in this test by the number of times it was necessary to spell a word before the subject recognized it.

The average number of words named on first spelling by the seeing group was 15.83, the average number named on first spelling by the blind group was 14. The average number of times it was necessary to spell words for the seeing group was 1.47, for the blind group 1.56.

Again we have slight differences in favor of the seeing group, but differences so slight that they are exceeded as in the first test by individual differences in the opposite direction. One of the blind subjects named 19 of the 22 words on the first spelling and the average number of repetitions required by him was but 1.22.

In the first test the errors made by both seeing and blind subjects were of four kinds, omission, transposition, insertion, and substitution. The percentages of the total errors made which belong to each of these classes are, seeing group, omission, 64.8, transpositions, 14.1, substitutions 7.8, insertions 13.1; blind group, omissions, 37,1, transpositions, 31.7, substitutions 21.5, and insertions 9.7. Omissions form the greatest number of errors in both groups and transpositions rank next, while the blind exceed in substitutions and transpositions and the seeing in omissions.

The results for the blind in this comparison are taken from the results obtained from the second group of blind persons, whom I tested with the object of noting peculiarities of method and errors. These subjects were asked to repeat the effort to spell each word until success was achieved, and were encouraged to do their thinking aloud. In the first test all of the subjects spelled the complete word forward first, then backward either by syllables or some other system of grouping. The syllabication and grouping were evidenced by the decided pauses between groups of letters, and also at times, by lip movements indicating a forward spelling process preceding the backward spelling. Two of these subjects spoke of thinking of the letters as in the Braille, whenever they experienced difficulty with the words.

In the second test the most accurate subject of all repeated every letter after me in a low tone, and as a rule named the words immediately after the last letter was given. Very rarely she spelled a word forward before naming it. She said she placed the letters in space from right to left as I named them. The other four all spelled words aloud before naming them, some spelled first backward then forward, one never recognized a word until he had spelled it completely forward, one sometimes succeeded in spelling the word completely and correctly without recognizing it, two spelled words partially and guessed the rest. All of these subjects spelled aloud the words that puzzled them, thus showing their dependence on the kinesthetic vocal element. Again several mentioned thinking of the letters as they would appear on the Braille.

From the results obtained I judge that the essential element in the visual imagery of words for the spelling process and perhaps therefore for verbal thought in general, is not its form but its relative spacial position, an attribute which the blind secures not through vision but through touch. This touch spacial attribute seems just as efficacious to the spelling process as does the visual spacial attribute. Perhaps its presence makes possible to the blind just as high a language development as is possible to the seeing person.

The fact that the visual element is not essential to a high degree of language development may perhaps account for the fact that the schools for the blind are able to carry their pupils to much higher levels intellectually than the schools for the deaf are able to carry their pupils. The auditory element in language seems to be an essential factor which cannot be supplied by any other element, consequently those ideas which are only developed in civilized man by the aid of language are never adequately attained by the congenitally deaf; the higher abstractions remain closed to them because their language development, their language understanding, is at best a crippled product.

The conclusions from the study are two. First, the tests in question have little or no value as objective tests for determining the use of visual imagery by a given individual. Second, that visual verbal imagery assists the spelling process rather through its attribute of relative space position than through its attribute of form, and that the attribute of relative space position can be equally well attained through tactual sensations.

CLASSIFICATION OF ERRORS.

Seeing	Omissions		Transpositions		Substitutons		Insertions	
Subjects	No.	Percent	No.	Percent	No.	Percent	No.	Percent
1..........	6	86	..	..	1	14	..	..
2..........	12	60	5	25	1	5	2	10
3..........	10	53	6	32	0	0	3	15
4..........	10	84	0	..	1	8	1	8
5..........	5	72	1	14	..	..	1	14
6..........	12	34	5	14	7	20	11	32
Total	55	389	17	85	10	47	18	79
Average		64.8	..	14.1	..	7.8	..	13.1

	Omissions		Transpositions		Substitutions		Insertions	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Blind Subjects								
1..........	7	33	10	48	3	14	1	5
2..........	10	41	4	17	6	25	4	17
3..........	4	40	5	50	0	..	1	10
4..........	3	37.5	1	12.5	3	37.5	1	12.5
5..........	9	34	8	31	8	31	1	4
Total	33	185.5	28	158.5	20	107.5	8	48.5
Average		37.1	..	31.7	..	21.5	..	9.7

TEST 1—SEEING SUBJECTS.

Words spelled by subject	Sub. 1		Sub. 2		Sub. 3		Sub. 4		Sub. 5		Sub. 6		
	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Group
Complexity ..	1	13	3	14	2	8	1	15	0	8	2	9	
Somnabulist..	1	25	4	30	2	10	0	20	0	15	2	28	
Superstition..	0	24	2	36	1	25	0	15	0	13	4	80	
Generosity....	0	20	0	15	0	11	0	15	0	28	0	20	
Contemporary	0	25	3	29	3	18	1	15	0	16	5	25	
Requisite.....	0	28	2	25	0	15	0	12	0	11	1	65	
Municipal....	0	20	1	30	1	12	2	10	0	8	0	15	
Ignominy.....	2	18	0	15	0	28	0	10	0	7	0	50	
Fortuitous....	0	18	1	25	1	20	0	15	0	13	1	27	
Acquaintance.	1	40	3	30	1	65	2	15	1	18	8	140	
Unexampled..	0	25	0	30	0	21	0	20	0	17	0	27	
Symmetrical..	0	18	1	18	3	22	1	20	2	30	3	20	
Reverberate...	0	18	0	12	0	15	0	15	1	17	1	20	
Punctuation..	0	22	0	21	1	12	0	24	0	18	2	13	
Suitable......	0	12	0	20	0	10	0	10	0	5	3	28	
Sociability....	2	41	0	60	0	20	3	30	3	15	2	25	
Magistrate....	0	22	0	20	0	15	2	15	0	15	0	20	
Fraction......	0	13	0	18	0	8	0	10	0	7	1	15	
Daughter.....	0	10	0	15	0	8	0	15	0	8	0	13	
Technicality..	0	58	0	19	4	70	0	18	0	30	0	55	
Irresolute....	0	36	0	20	0	15	0	20	0	10	0	80	
Knowledge...	0	18	0	20	0	12	0	17	0	8	0	57	
Words with errors.......	5		9		10		7		4		13		8
Ave. error in wds. with error..	1.4		2.		1.9		1.7		1.7		3.		1.95
Ave. error (all words).....	0.33		0.90		0.86		0.54		0.33		1.59		.76
Average time.	23.8		23.7		20.		16.1		14.4		37.8		22.63
*Efficiency index......	4.1		4.1		4.95		6.17		6.92		2.59		4.39

$$\text{*Efficiency index} = \frac{100\text{—Ave. error}}{\text{Ave. time}}$$

TEST 1—BLIND SUBJECTS.

Words spelled by subject	Sub. 1		Sub. 2		Sub. 3		Sub. 4		Sub. 5		Sub. 6		
	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Errors	Time in secds.	Group
Complexity...	2	45	1	15	1	50	1	15	1	30	0	5	
Somnabulist..	3	45	4	30	5	35	2	35	2	20	1	12	
Superstition..	1	80	2	30	0	50	2	35	3	30	0	30	
Generosity....	1	55	2	45	0	30	2	15	2	12	0	15	
Contemporary.	0	40	1	50	1	40	6	30	0	20	0	40	
Requisite.....	0	15	0	30	1	15	2	20	3	20	0	8	
Municipal....	1	25	0	15	0	38	2	30	3	30	0	12	
Ignominy.....	1	20	1	15	0	20	0	30	0	30	0	30	
Fortuitous....	1	30	1	15	2	25	3	20	1	25	1	10	
Acquaintance.	1	30	0	30	2	40	3	30	2	20	1	12	
Unexampled..	2	20	2	20	1	30	1	30	1	80	0	12	
Symmetrical..	1	35	3	20	1	20	3	20	1	30	1	15	
Reverberate...	1	30	0	20	1	55	0	30	2	50	0	80	
Punctuation..	0	25	2	25	0	50	3	30	1	13	0	15	
Suitable......	0	12	2	15	0	12	0	12	1	8	0	7	
Sociability....	0	25	1	18	5	60	1	30	0	15	1	18	
Magistrate....	0	20	0	25	1	27	0	22	2	30	0	10	
Fraction......	0	10	4	10	0	10	0	8	0	10	0	8	
Daughter.....	0	12	1	10	0	22	0	10	1	10	0	8	
Technicality..	2	60	2	30	1	30	5	30	2	50	1	20	
Irresolute....	0	30	2	33	0	43	2	20	2	20	0	12	
Knowledge...	0	40	1	15	0	35	2	18	1	15	0	10	
Words with errors......	12		17		12		16		18		6		13.5
Ave. error in wds. with error..	1.4		1.8		1.9		2.5		1.7		1.		1.71
Ave. error (all words).....	.77		1.45		1.		1.81		1.40		0.27		1.11
Average time.	32.		23.4		33.5		23.6		25.8		17.2		25.91
Efficiency index......	3.10		4.21		2.95		4.16		3.82		5.8		3.82

TEST 2—SEEING SUBJECTS.

Word spelled by Experimenter	Subject 1 Repetitions	Subject 2 Repetitions	Subject 3 Repetitions	Subject 4 Repetitions	Subject 5 Repetitions	Subject 6 Repetitions	Group
Stimulus	2	2	2	1	1	1	
September	6	1	1	1	1	1	
Concerned	2	1	2	8	4	5	
Various	1	1	1	4	1	1	
Description	2	1	1	4	1	2	
Christmas	2	2	1	1	1	1	
Predominant ..	6	3	2	1	1	2	
Objects	1	1	3	1	1	1	
Occurred	1	1	1	2	1	1	
Dependence ...	2	1	1	2	1	2	
Preceding	2	1	2	1	1	1	
Remembered ..	1	1	1	1	1	1	
Muscular	1	1	1	1	1	1	
Operation	1	1	1	2	1	1	
Musical	2	1	1	2	1	1	
Whistling	1	1	1	2	1	1	
Beautiful	1	1	1	1	1	1	
Significant	1	1	2	1	1	1	
Orange	1	1	1	2	1	1	
Indication	2	2	1	1	1	2	
Distinguish	3	1	2	1	1	1	
Important	1	1	1	1	1	1	
Named on first spelling	11	18	15	13	21	17	Ave. 15.83
Average number times spelled..	1.9	1.22	1.36	1.86	1.13	1.35	1.47

TEST 2—BLIND SUBJECTS.

Words spelled by Experimenter	Subject 1 Repetitions	Subject 2 Repetitions	Subject 3 Repetitions	Subject 4 Repetitions	Subject 5 Repetitions	Subject 6 Repetitions	Group
Stimulus	3	..	3	3	3	1	
September	1	2	4	1	2	1	
Concerned	3	4	2	2	2	3	
Various	1	1	1	1	1	1	
Description	2	2	2	1	5	1	
Christmas	1	3	2	1	2	1	
Predominant ..	3	3	..	1	2	3	
Objects	1	1	2	1	1	1	
Ocourred	1	2	1	1	1	1	
Dependence ...	1	1	..	1	1	1	
Preceding	1	2	..	1	1	1	
Remembered ..	1	1	1	1	1	1	
Muscular	1	1	3	3	4	1	
Operation	1	1	1	1	1	1	
Musical	1	1	1	1	1	1	
Whistling	1	1	2	1	1	2	
Beautiful	1	1	1	1	1	1	
Significant	1	1	2	1	2	1	
Orange	1	3	1	1	1	1	
Indication	1	4	3	1	1	3	
Distinguish	3	3	..	1	2	1	
Important	2	1	..	1	1	1	
Named on first spelling	16	11	7	19	13	18	Ave. 14
Ave. number times spelled..	1.[illegible]5	1.85	1.88	1.22	1.68	1.31	1.56

DISCUSSION.

Dr. Crohn: When one works with words one is working with objects that have so many collateral associations that we are in the dark as to time tests, as to error and other tests. But I think if figures have been used, an arbitrary number, say, from one to 1,789,910, that could not possibly call forth any painful memory or sad memory or be connected with the emotion trend of the subject, a lot of collateral issues would not be brought into the matter. Words are always connected with emotional pain. There is always something happening in our life that a word may bring forth, but if we take figures, they bring nothing to mind but the simple form of the figure, which rarely has any association with it. I think that had the experiments by Dr. Towne been conducted with figures instead of words they would have been clearer and less liable to error.

BF367 c.1
T66
Town, Harrison Clara
The contribution of visual imagery to verbal thought, A comparative study of seeing and blind subjects.

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